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EXAMINER

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/614,807  
Filing Date: July 09, 2003  
Appellant(s): SEGAL ET AL.

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Sandra Thompson, PhD, Esq.  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 5 June 2008 appealing from the Office action mailed 15 November 2007.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

US 6,896,748	Perry et al	5-2005
US 6,391,163	Pavate et al	5-2002

US 2001/0035238

Nagano et al

11-2001

### **(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

1. Claims 16 and 19-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Pavate et al (US 6,391,163) in view of Perry et al (US 6,896,748).

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

However, Pavate et al do not teach the grain size of the copper sputtering target. Pavate et al does include a teaching regarding the grain size (see col. 2, lines 55-59, col. 3, lines 2-4 and col. 3, line 66 to col. 4, line 3), such that the grain size should be kept as small as possible to achieve better sputtering characteristics.

Perry et al teach (see abstract and col. 3, lines 42-46) a method of forming copper alloy sputtering targets that achieves grain sizes as small as 0.1  $\mu\text{m}$ .

Therefore, it would have been obvious to one of ordinary skill in the art to have used the process of Perry et al to make the sputtering targets of Pavate et al so that the sputtering targets of Pavate et al would have had as small a grain size as possible as suggested by Pavate et al.

Regarding claims 18-21, Perry et al teach (see col. 4, lines 8-18) that the process achieved a uniform microstructure throughout the target. Thus, one of ordinary skill in the art would have expected the resultant sputtering target to have had a uniform grain

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size (less than 10% standard deviation) and hardness (less than 3.5% standard deviation).

Regarding claim 22, Perry et al suggest (see col. 4, lines 43-60) that when the sputtering target had sufficient strength, it could be used as a monoblock with a backing plate.

Regarding claim 23, Pavate et al suggest using a backing plate. It would have been within the expected skill of a routineer in the art to have selected an appropriate backing plate attachment method, such as diffusion bonding with a bond yield strength of greater than about 15 ksi.

Regarding, claims 24-26, Pavate et al teach (see col. 2, lines 55-64) that the crystallographic orientation of the sputtering target was known to be a result effective variable. Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the orientation of the sputtering target in order to achieve proper sputtering results.

Regarding claim 27, Pavate et al suggest Al, Zn or Mg.

Regarding claim 28, Pavate et al teach a preferred range of alloy additive of 0.01 wt% to 5 wt%.

2. Claims 29, 30 and 32-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748).

Perry et al teach (see abstract, col. 2, lines 6-27 and col. 3, lines 25-46) a copper alloy sputtering target including less than 10 wt% alloying elements with an average grain size of from 0.1-7.5  $\mu\text{m}$ . Perry et al teach (see col. 4, lines 8-17) that the

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sputtering target has a uniform microstructure. Therefore, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a grain size uniformity with a standard deviation of less than about 15% throughout the target.

It would have been obvious to one of ordinary skill in the art to have selected the alloying element from the list disclosed in claim 29.

Regarding claim 30, since the sputtering target of Perry et al had a uniform microstructure, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a grain size uniformity with a standard deviation of less than about 10% throughout the target.

Regarding claim 32, since the sputtering target of Perry et al had a uniform microstructure, one of ordinary skill in the art would have found it obvious to have made the sputtering target with a hardness uniformity with a standard deviation of less than about 5% throughout the target.

Regarding claim 33, Perry et al suggest (see col. 4, lines 43-6) making the sputtering target as a monoblock.

Regarding claim 34, Perry et al admit that backing plates had been used. It would have been obvious to one of ordinary skill in the art to have used a backing plate with the sputtering target of Perry et al if more strength were desired in the sputtering target. It would have been within the expected skill of a routineer in the art to have selected an appropriate backing plate attachment method, such as diffusion bonding with a bond yield strength of greater than about 15 ksi.

Regarding claims 35-37, crystallographic orientation was known to be a result effective variable in the prior art (see Pavate et al (col. 2, lines 55-64)). Therefore, it would have been obvious to one of ordinary skill in the art to have optimized the orientation of the sputtering target in order to achieve proper sputtering results.

3. Claims 31, 38 and 39 are rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748) in view of Pavate et al (US 6,391,163).

The teachings of Perry et al are described above.

Perry et al are silent with respect to the identity of the alloying element and the hardness of the resulting alloy.

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

Therefore, it would have been obvious to one of ordinary skill in the art to have used Mg, Zn or Al as the alloying element in order to achieve the increased hardness of the sputtering target so that the resulting sputtering properties could be improved.

Regarding claim 39, Pavate et al teach a preferred range of alloy additive of 0.01 wt% to 5 wt%.

4. Claim 110 is rejected under 35 U.S.C. 103(a) as being unpatentable over Perry et al (US 6,896,748) in view of Nagano et al (US 2001/0035238) and Pavate et al (US 6,391,163).

The teachings of Perry et al are described above.

Perry et al are silent with respect to the identity of the alloying element and the hardness of the resulting alloy.

Nagano et al teach (see abstract and paragraphs 5-8 and 21-28) a copper sputtering target including 0.001-1.0 at% additions of various alloying elements to improve the thermal stability and to refine the grain structure. Nagano et al disclose (in paragraph 27) a laundry list of suitable alloying elements that improved the electromigration resistance and/or thermal stability which included Cd, Ca, Au, Ag, Be, In, B, Ga, Mn, Sn, W, Cr, Co, Te, Ti, Zr, Sc, Pt, Nb, Re, Mo and Hf.

Therefore, it would have been obvious to one of ordinary skill in the art to have used one of the disclosed elements as the alloying element as suggested by Nagano et al in order to achieve a sputtering target with better electromigration resistance and/or thermal stability.

Neither Nagano et al nor Perry et al include teaching about the hardness of the resulting sputtering target.

Pavate et al teach (see abstract and col. 3, lines 21-29) a copper alloy sputter target including 100 ppm-10 wt% of an alloying element such as Mg, Zn, Al, Fe, Ni or Si with a hardness of 100-250 HV (Vickers). Such a Vickers hardness equates to more than 40 on the Brinell hardness scale (HB).

Therefore, it would have been obvious to one of ordinary skill in the art either (1) that the alloying additions of Nagano et al would have produced the increased hardness similarly to Pavate et al (since Nagano et al also suggest using Zn, Fe or Ni as the alloying element) or (2) to have used Mg, Zn or Al as an additional alloying element in



order to achieve the increased hardness of the sputtering target so that the resulting sputtering properties could be improved.

#### **(10) Response to Argument**

Appellant has argued that the claims should be granted an effective filing date of 16 December 1999 (the filing date of the parent application, now US Patent No. 6,878,250), and thus, Perry et al does not constitute prior art against the claims.

In response, Appellant's attention is directed to MPEP 706.02.VI. (cited in appeal brief on page 13), of which the critical part is that statement that: "[a]ny claims which are fully supported under 35 U.S.C. 112 by the earlier parent application have the effective filing date of that earlier parent application." In this instance, the presently pending claims are not fully supported under 35 U.S.C. 112 by any prior application. In particular, the features of the claimed hardness, the claimed grain size uniformity standard deviation and the alloying element being at least one of Cd, Ca, Be, Li, Mg, Pd, Hg, In, Zn, B, Ga, Mn, Sn, Ge, W, Cr, O, Sb, Ir, P, As, Co, Te, Fe, S, Zr, Sc, Si, Nb, Re or Hf are not supported under 35 U.S.C. 112 by any earlier application. Therefore, since all of the claims are not fully supported, in the context of 35 U.S.C. 112, by the earlier filed applications they cannot be treated as having an earlier effective filing date.

Appellant's remarks on page 30 are noted, but do not appear to be germane to the issues present in this appeal.

#### **(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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Primary Examiner, Art Unit 1795

Conferees:

/Susy Tsang-Foster/

Supervisory Patent Examiner, Art Unit 1795

/Gregory L Mills/

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